

Positions and areas of sun spots—Continued

Date	Eastern standard civil time	Heliographic		Area	
		Longitude	Latitude	Spot	Group
Feb. 15. (Naval Observatory.)	Hr. min. 11 45	° -48.0 -37.0 -29.5 +11.0 +17.5 +79.5	° +32.5 +11.0 -13.5 -28.5 +13.0 -13.0	 123 93 309	 93 123 31
Feb. 16. (Naval Observatory.)	11 31	-37.0 -23.0 -17.0 +24.5 +34.0	+32.0 +10.5 -14.0 -27.0 +15.0	 123 77 31	62 216
Feb. 17. (Naval Observatory.)	11 45	-62.5 -25.0 -8.0 -4.5 +37.5 +49.0	+12.0 +34.0 +10.5 -13.5 -27.5 +14.0	 31 93 31	185 154 123
Feb. 18. (Naval Observatory.)	12 1	-49.0 -44.0 -12.0 +4.5 +9.5 +50.0	-9.5 +11.5 +34.0 +10.5 -13.5 -27.5	 93 31 108 93	31 93 123
Feb. 19. (Mount Wilson.)	15 45	-33.0 -32.0 -1.0 +3.0 +20.0 +25.0 +67.0	-10.5 +12.0 +18.0 +34.0 +10.0 -13.0 -29.0	 17 1 13 27 124	73 1
Feb. 20. (Mount Wilson.)	13 50	-85.0 -21.0 -19.0 +15.0 +33.0 +36.0 +79.0	+13.0 -10.0 +12.0 +34.0 +11.0 -14.0 -28.0	 83 154 12 10 13 137	83 154 12
Feb. 21. (Naval Observatory.)	12 36	-68.0 -59.5 -6.5 +46.0 +49.0	+13.5 -26.0 -9.5 +15.0 -13.5	123 31 15 108	123 31 154

Positions and areas of sun spots—Continued

Date	Eastern standard civil time	Heliographic		Area	
		Longitude	Latitude	Spot	Group
Feb. 22. (Naval Observatory.)	Hr. min. 11 45	° -55.0 -47.5 -30.0 +7.0 +7.0 +57.5 +60.5	° +13.5 -26.0 +11.5 -10.5 -18.5 +12.5 -14.0	 31 108	123 31 46 185 31
Feb. 23. (Harvard.)	10 27	-66 -36 +20 +73	-13 +14 -9 -15	41 139	58 210
Feb. 24. (Naval Observatory.)	11 48	-85.0 -67.0 -27.0 -3.0 +34.5	-18.0 -18.5 +14.0 +11.0 -10.5	15 46 46 123	
Feb. 25. (Mount Wilson.)	14 20	-66.0 -65.0 -53.0 -13.0 -12.0 -2.0 +14.0 +54.0	-18.0 -25.0 -18.0 +13.0 -27.0 -20.0 +11.0 -12.0	147 21 16 4 18 63	
Feb. 26. (Naval Observatory.)	11 46	-62.5 -40.5 +1.0 +12.0 +68.0	-18.0 -18.0 +14.0 -18.0 -9.5	139 15 31 62	
Feb. 27. (Naval Observatory.)	11 46	-64.0 -42.0 -37.0 +12.5 +17.5 +28.0 -54.0 -27.5 +27.0 +33.0	+22.5 -18.0 -24.5 +14.0 -26.5 -17.5 +22.0 -18.0 +15.0 -25.0	31 10 123 31 15 62 139 31 123 26	
Feb. 28. (Naval Observatory.)	11 45				

AEROLOGICAL OBSERVATIONS

By WELBY R. STEVENS

With the exception of the mean temperatures at 4,500 meters above Ellendale, mean free-air temperatures were above normal at all aerological stations. Departures aloft were in general of the same order of magnitude as at the surface.

Humidity departures were unimportant, although they were mostly below normal at Broken Arrow and Royal Center and above normal at Groesbeck.

Vapor pressure departures were mostly positive.

North of the thirty-seventh parallel and east of the one hundredth meridian the general wind resultants near the surface were W. to NW.; south of this latitude they were W. to SW.; west winds prevailed aloft east of the one hundredth meridian. On the north Pacific coast southerly winds prevailed to 3,000 meters, above which they shifted to northerly; on the south Pacific coast southerly winds were general to 500 meters, above which they shifted to northerly. The resultants show that there was an excess of southerly component over the normal (or less northerly component) corresponding to the well-defined excess of mean temperature over practically the entire country. (See Chart III.) Perhaps the excess of mean temperature was due more to the lack of severe cold waves than deviation of resultant winds from normal. Correlation between wind direction and temperature is not perfect, as has been pointed out before, since southerly winds often transport cold air masses and northerly winds warm masses. Resultant velocities were about normal. The table below shows winds of 40 m. p. s. or more observed during the month.

Date	Station	Velocity (m. p. s.)	Altitude (m. s. l.)
1.	Cheyenne	52 WNW	4,000
2.	Washington	54 WNW	4,500
3.	Ellendale	40 NW	5,000
12.	Medford	44 N	5,750
13.	Medford	45 NE	6,750
20.	Cheyenne	60 WNW	3,250
24.	Cheyenne	40 WNW	4,000
26.	Atlanta	40 W	4,000
26.	Due West	49 W	4,750

The unusually high WNW. winds observed at Cheyenne are of particular interest, since verifying pilot-balloon ascents were made on two different days during the month, when velocities considerably above normal were observed. In each case the verifying ascent showed the same general character as the first.

On the 1st and 20th Cheyenne was under the influence of almost identical pressure conditions. A low of great intensity was moving inland from the north Pacific coast with a rather weak area of high pressure over Colorado. On the 24th the situation was quite different. An area of high pressure was moving in from the NW. By the morning of the 25th it had overspread the entire Rocky Mountain region and the Plains States. Relative to the high winds frequently observed over Cheyenne, the Official in Charge says:

Perhaps the most level pass across the Rockies lies in southern Wyoming, with an elevation of 6,000 to 7,000 feet; on either side are ranges 9,000 to 12,000 feet; however, the Laramie Mountains form a barrier of lesser height than the ranges across the east end

of this pass, and the crest of the pass over these mountains is from 2,000 to 3,000 feet higher than the local office; it is believed this topography together with the distribution of pressure may be the cause of the freak winds, as it is almost invariably observed that if there is a low over Alberta, or even over British Columbia and Washington with a toe extending into northern Wyoming in combination with a high over western Colorado or Utah, or even Nevada and Arizona, unusually high winds are recorded for elevations of 2,000 to 4,000 feet. If pressure conditions are reversed, the high being over the Dakotas, Montana, northern Wyoming, and sometimes as far westward as Minnesota, also sometimes over Idaho with a toe extending into northern Wyoming, in combination with a low over western Colorado, Utah, and even as far distant as Arizona and southern California, there seems to be a calm or marked falling off of velocity at the same altitude, almost invariably.—Geo. W. Pitman.

Kite flights were made at Broken Arrow and Groesbeck on the morning of the 17th within the southern sector of a well-developed cyclone which was central over southern Kansas. The flight at Groesbeck shows an unstable lapse rate to 693 meters, with a stable stratification to 2,254 meters, above which the gradient again became unstable to maximum altitude (2,545 meters). The wind direction changed from S. at the surface to WSW. aloft, the decidedly unstable rate from 2,254 meters to 2,545 meters being due to importation of colder air masses by the WSW. wind. A thunderstorm occurred NW. of the station during the flight.

The flight at Broken Arrow shows a stable rate on the ascent to highest altitude; however, on the descent temperature fell aloft with wind shifting from SW. and SSW. to WSW., while temperature at the surface rose, thus building up an unstable gradient.

A flight was made at Groesbeck on the 5th while rain was falling. It was followed by thunderstorms at a number of stations in eastern Texas. On this date Groesbeck was under the influence of a rather weak pressure system with light to moderate SSW. and SW. winds extending to at least 3,000 meters. Temperature had risen from the preceding day from the surface to 1,100 meters, while there was a fall from 1,250 meters to 2,700 meters. The air was near saturation from the surface to 3,000 meters and, coupled with a high lapse rate, a large amount of energy was available for convection, which soon resulted in the thunderstorms mentioned above.

TABLE 1.—Free-air temperatures, relative humidities, and vapor pressures (mb.) during February, 1927

TEMPERATURE (°C.)											
Altitude, m. s. l. (m.)	Broken, Ar- row, Okla. (233 m.)		Due West, S. C. (217 m.)		Ellendale, N. Dak. (444 m.)		Groesbeck, Tex. (141 m.)		Royal Center, Ind. (225 m.)		Wash- ing- ton, D. C. (7 m.) (mean)
	Mean	Depart- ure from 9-yr. mean	Mean	Depart- ure from 6-yr. mean	Mean	Depart- ure from 10-yr. mean	Mean	Depart- ure from 9-yr. mean	Mean	Depart- ure from 9-yr. mean	
Surface....	8.4	+2.9	12.3	+3.2	-8.2	+1.2	12.2	+1.7	2.7	+3.8	7.4
250.....	8.4	+3.0	12.1	+3.2			11.8	+1.6	2.5	+3.8	5.9
500.....	7.8	+3.5	11.4	+3.7	-8.4	+1.1	11.1	+1.8	0.6	+3.7	5.0
750.....	7.9	+4.3	10.7	+3.9	-7.7	+1.4	10.8	+1.8	-0.2	+3.6	3.7
1,000.....	7.9	+4.5	9.4	+3.4	-6.0	+2.3	11.1	+2.3	-0.6	+3.4	2.3
1,250.....	7.8	+4.7	8.0	+3.0	-4.9	+2.8	10.8	+2.6	-0.6	+3.8	1.5
1,500.....	7.0	+4.6	6.8	+2.8	-4.9	+2.7	9.4	+2.0	-1.4	+3.5	1.3
2,000.....	4.7	+3.9	4.0	+2.0	-7.2	+1.8	6.4	+1.1	-3.5	+2.7	0.1
2,500.....	2.1	+3.7	1.4	+1.8	-10.3	+1.0	3.2	+0.3	-5.8	+2.3	-2.0
3,000.....	-0.8	+3.5	-2.0	+0.9	-13.8	+0.2	1.0	+0.5	-9.0	+1.6	-5.9
3,500.....			-4.9	+0.7	-16.6	+0.1	0.6	+1.5	-12.2	+1.2	
4,000.....			-7.9	+0.8	-19.1	+0.2	-2.5	+1.9	-15.2	+1.3	
4,500.....			-9.7	+1.6	-22.3	-0.2	-6.4	+0.6	-18.4	+1.3	
5,000.....											

RELATIVE HUMIDITY (%)											
Surface....	68	0	70	+2	80	-1	77	+4	74	-3	65
250.....	68	0	70	+2			77	+6	74	-3	62
500.....	63	-2	65	0	79	-1	76	+8	73	-4	59
750.....	54	-7	62	-1	74	0	71	+7	68	-6	59
1,000.....	51	-5	62	-1	68	-3	63	+4	63	-6	59
1,250.....	48	-4	61	+1	59	-5	60	+4	54	-10	56
1,500.....	43	-7	58	0	55	-5	60	+8	52	-8	51
2,000.....	43	-3	55	0	50	-1	58	+11	48	-7	44
2,500.....	42	-3	52	-1	50	0	55	+11	45	-9	42
3,000.....	46	+2	59	+8	61	+5	52	+9	45	-10	47
3,500.....			49	+4	64	+10	49	+8	38	-17	
4,000.....			45	-3	62	+9	45	+7	34	-22	
4,500.....			47	-2	62	+9	53	+19	30	-22	
5,000.....											

VAPOR PRESSURE (mb.)											
Surface....	7.90	+1.53	10.57	+2.15	2.75	+0.08	11.74	+1.90	5.77	+1.16	6.74
250.....	7.84	+1.52	10.46	+2.16			11.45	+2.04	5.69	+1.15	5.81
500.....	6.90	+1.35	9.32	+1.91	2.69	+0.07	10.72	+2.23	4.93	+0.94	5.24
750.....	5.86	+1.00	8.71	+1.87	2.72	+0.25	9.62	+1.92	4.27	+0.66	4.78
1,000.....	5.32	+1.34	8.07	+1.71	2.71	+0.31	8.29	+1.45	3.67	+0.40	4.32
1,250.....	5.30	+1.35	7.25	+1.44	2.63	+0.31	7.37	+1.29	3.09	+0.19	3.88
1,500.....	4.50	+1.36	6.36	+1.10	2.38	+0.22	6.52	+1.23	2.79	+0.20	3.45
2,000.....	3.81	+1.00	4.82	+0.63	2.03	+0.23	5.06	+0.97	2.23	+0.15	2.72
2,500.....	3.06	+0.75	3.68	+0.26	1.69	+0.21	3.64	+0.38	1.71	+0.01	2.13
3,000.....	2.62	+0.73	3.09	+0.45	1.39	+0.24	2.76	+0.01	1.16	-0.19	1.67
3,500.....			1.95	+0.03	1.20	+0.32	2.53	+0.25	0.80	-0.23	
4,000.....			1.25	-0.31	0.98	+0.29	1.68	-0.11	0.63	-0.17	
4,500.....			1.09	-0.17	0.95	+0.39	1.68	+0.40	0.53	-0.17	
5,000.....											

¹ Naval Air Station, Anacostia, D. C.

TABLE 2.—Free-air resultant winds (m. p. s.) during February, 1927

Altitude (m.) m. s. l.	Broken Arrow, Okla. (233 meters)				Due West, S. C. (217 meters)				Ellendale, N. Dak. (444 meters)				Groesbeck, Tex. (141 meters)				Royal Center, Ind. (225 meters)				Washington, D. C. (34 meters)			
	Mean		9-yr. mean		Mean		6-yr. mean		Mean		10-yr. mean		Mean		9-yr. mean		Mean		9-yr. mean		Mean		7-yr. mean	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Surface.....	S. 4°W.	0.8	N. 37°W.	0.4	S. 54°W.	1.7	S. 81°W.	1.9	N. 66°W.	3.2	N. 47°W.	3.3	S. 78°W.	1.2	S. 82°W.	0.7	N. 78°W.	1.4	S. 84°W.	1.9	N. 74°W.	1.5	N. 49°W.	1.6
250.....	S. 8°W.	1.0	N. 56°W.	0.3	S. 56°W.	2.2	S. 82°W.	2.2	.....	.....	.....	.....	S. 52°W.	2.0	S. 66°W.	1.0	N. 70°W.	1.7	S. 82°W.	2.2	N. 70°W.	4.1	N. 66°W.	3.4
500.....	S. 8°W.	3.1	S. 50°W.	0.8	S. 71°W.	4.5	S. 81°W.	4.1	N. 73°W.	3.4	N. 52°W.	3.4	S. 33°W.	3.5	S. 47°W.	1.9	S. 78°W.	2.5	S. 69°W.	3.7	N. 64°W.	6.0	N. 68°W.	5.2
750.....	S. 24°W.	4.2	S. 55°W.	2.0	S. 72°W.	6.2	S. 78°W.	5.4	N. 78°W.	4.8	N. 58°W.	4.6	S. 44°W.	4.4	S. 53°W.	2.6	S. 87°W.	3.9	S. 71°W.	5.4	N. 62°W.	7.8	N. 65°W.	6.6
1,000.....	S. 37°W.	5.4	S. 65°W.	2.9	S. 86°W.	8.2	S. 82°W.	6.8	N. 73°W.	5.3	N. 57°W.	5.4	S. 52°W.	5.2	S. 62°W.	3.8	N. 75°W.	5.6	S. 79°W.	6.6	N. 71°W.	8.7	N. 70°W.	8.0
1,250.....	S. 49°W.	6.8	S. 85°W.	3.8	N. 88°W.	10.4	S. 85°W.	8.3	N. 72°W.	6.2	N. 57°W.	6.3	S. 59°W.	6.8	S. 72°W.	4.9	N. 72°W.	6.8	S. 86°W.	7.6	.....	.....	N. 68°W.	10.2
1,500.....	S. 46°W.	7.1	S. 89°W.	4.7	N. 88°W.	11.9	S. 87°W.	10.1	N. 73°W.	6.8	N. 60°W.	7.3	S. 56°W.	8.8	S. 77°W.	6.3	N. 67°W.	8.2	N. 88°W.	8.9	N. 73°W.	9.8	N. 68°W.	11.6
2,000.....	S. 50°W.	8.2	N. 85°W.	6.6	S. 86°W.	12.6	S. 89°W.	12.8	N. 72°W.	8.3	N. 62°W.	9.5	S. 62°W.	9.6	S. 86°W.	7.7	N. 67°W.	11.3	N. 85°W.	11.0	N. 68°W.	11.2	N. 72°W.	14.0
2,500.....	S. 53°W.	9.8	N. 85°W.	7.6	N. 87°W.	15.0	S. 89°W.	14.6	N. 72°W.	9.7	N. 64°W.	11.5	S. 70°W.	10.3	S. 87°W.	8.8	N. 75°W.	10.6	N. 85°W.	12.8	N. 70°W.	13.9	N. 76°W.	16.2
3,000.....	S. 60°W.	11.7	N. 84°W.	9.8	N. 89°W.	16.2	S. 87°W.	16.3	N. 75°W.	10.6	N. 66°W.	12.8	S. 67°W.	11.7	S. 86°W.	10.6	N. 77°W.	11.2	N. 87°W.	13.6	N. 82°W.	17.2	.....	.....
3,500.....	S. 80°W.	9.9	N. 69°W.	10.9	S. 87°W.	16.4	N. 88°W.	17.1	N. 80°W.	11.6	N. 69°W.	13.0	S. 45°W.	12.0	W.	.....	.....	.....	.....	.....	.....	.....	.....	.....
4,000.....	.....	.....	.....	.....	W.	15.5	S. 88°W.	15.3	N. 86°W.	12.9	N. 68°W.	14.0	S. 45°W.	14.0	W.	.....	.....	.....	.....	.....	.....	.....	.....	.....
4,500.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
5,000.....	.....	.....	.....	.....	N. 68°W.	20.0	N. 82°W.	19.7	N. 82°W.	15.1	N. 68°W.	15.2	S. 45°W.	14.0	N. 86°W.	12.5	S. 77°W.	23.7	S. 77°W.	19.3	.....	.....	.....	.....